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Dear Reader,

We hope you are having a great summer. In today's world we do not know if we have to wish it sunny and warm or cloudy and cold.

The June-July timeframe was really rich in events and was also the period of Eurosatory in Paris, just before the Olympic Games. We could have dedicated this whole document to it, but we found that various journals covered it pretty extensively already and that it would be hard for us to bring some added value. For the French speaker, we could only recommend the overview written by Mr. Olivier Dujardin from the Centre Français de Recherche sur le Renseignement.

While on the beach or already in the office, we present you therefore some striking news on the following topics:

We wish you an interesting read.

Foresightly Yours,

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1. Applications of AI and data

1.1	**MBDA's Ground Warden AI-System makes debut at Eurosatory 24** A promotional video and French Army demonstration provide insight into how the Ground Warden system will improve target detection for human operators of the AKERON family of manoeuvrable anti-armour missiles. *Assessment:* The Ground Warden system collects battlefield information and then uses AI to process the collected data to identify target information and improve situational awareness. The processed data is then relayed back to a human operator who uses it to target and navigate AKERON missiles to identified targets. Its main value is in providing real-time matching between a reference image and the feed from an AKERON seeker video to identify targets that are beyond operator line of sight or hidden. An MBDA promotional video shows how Ground Warden can pair with a small quad-copter uncrewed aerial system (UAS). The UAS sends AI processed video surveillance of a potential target back to a soldier operating the Ground Warden system tablet. This information is then passed to another soldier who launches an AKERON missile at the target. The video shows how the missile recalibrates its target based on AI-processed intelligence from the UAS to strike a tank hidden by trees, increasing the flexibility and agility of forces in battlefield environments. The French Army also carried out a demonstration during Eurosatory that showed the system using video taken by cameras on the AKERON missile itself rather than a UAS. In the demonstration scenario, an AKERON missile is fired towards a targeted tank while also sending images back to a human operator who can modify the missile's trajectory. The missile's surveillance capability also identifies two additional tanks that are beyond the line of sight of the operators, resulting in the operators launching two additional AKERON systems that are then maneuvered to the hidden and newly identified targets.

Figure 1: A series of images from the MBDA promotional video released at Eurosatory 24. Clockwise from top left, the screenshots show a small UAS taking an image of a potential target, which is transmitted back to the Ground Warden tablet (top right), where it is interpreted by a human operator. That information is then used as targeting for the launch of an AKERON anti-armour missile (bottom right), which then flies to the newly located target (bottom left)

1.2	**Finding needles in the haystack of space** DARPA contractor Slingshot Aerospace debuted an AI model designed to detect outlier satellites among large satellite constellations (source and source) *Assessment:* The employment of large constellations of small satellites for communications and remote sensing has created efficiencies and challenges for the commercial sector defence and security communities. One of the challenges is the potential for either malfunctioning or potentially threatening satellites to "hide" as a part of these constellations. This concern has heightened in the United States in response to China's announced plans to launch two mega-constellations—including one that is planned to have nearly 13,000 satellites. In addition, the U.S. Department of Defense believes Russia is developing a satellite that could carry a nuclear weapon. In response to these possible threats, on 5 June contractor Slingshot Aerospace unveiled its Agatha model to detect satellites that are operating outside of the norms of the surrounding constellation. The model uses inverse reinforcement learning to not only recognize and track anomalous spacecraft manoeuvres or other activity but also to assign motivation to those actions. Audrey Schaffer, the company's vice president of strategy and policy told *C4ISRNet that*, "Agatha doesn't just identify that this particular satellite is an outlier. It can also make an assessment of why the satellite is behaving differently than the other satellites in the constellation and what policies or operational directives it might be following that explain the behaviour."

1.3	**AI for the acquisition workforce** The U.S. Army is launching a pilot program to test how generative AI can improve the efficiency of its acquisition workforce, demonstrating the broad applicability of AI even to mundane back-office functions and processes (source) *Assessment:* In July, the Army began a two-phased program to better understand how it's acquisition and logistics enterprise can take advantage of generative AI tools to improve efficiency of some acquisition related processes. Jennifer Swanson, deputy assistant secretary of the Army for data, engineering, and software, noted generative AI has promise in improving a process such as contract writing if it can be validated through testing. According to Swanson, "might [AI] one day be able to write a contract? We hope so. But we've got to pilot and test it and make sure everyone is comfortable with it first." In addition, the program will provide insight into the range of existing industry tools that could be adapted to support the Army's efforts to test and later adopt large language models to support a range of activities. The model the service will use will be trained on Army data and provide citations that indicate where the data it provides originated.

2. Robotics and Autonomous Systems

2.1	**"A moment in history": French efforts to manage the drone – counter drone competition** In separate comments made during the Eurosatory Exhibition in Paris in June, representatives of the French Ministry of Defence captured the dynamic nature of the offense – defence competition in an age of technological disruption and the complexity of the investment decisions related to maintaining advantage (or at least parity) in these current competitions while also planning for the future (source and source) *Assessment:* During a tour of the French Army stand at Eurosatory on June 19, French Army Chief of Staff General Pierre Schill reflected on the changing nature of conflict and, in particular, the competition between uncrewed systems (UAS) and of counter-drone capabilities. Schill made the point that the ascendence of small UAS is likely to be temporary observing that "the life of impunity of small, very simple drones over the battlefield is a snapshot in time. Right now, it's being exploited, that's clear, and we have to protect ourselves…[but] the shield [of counter-drone capabilities] is going to grow." Schill also pointed to examples of the rapid battlefield change that have marked the conflict in Ukraine such as the prevalence of first-person view drones (FPV) and the declining utility of the Bayraktar drone. He told reporters that FPV drones currently incur about 80% of the damage on the front line in Ukraine, though less than a year ago those systems were not being employed. Similarly, the Bayraktar drone was a key component of Ukraine's drone inventory at the start of the war but due to its vulnerability to electronic warfare (EW) techniques it is no longer being used. Despite this recognition of the shifting nature of the operational context and offense versus defence competition, two days before Schill's remarks, on June 17, French Armed Forces Minister Sebastian Lecornu signalled the country's commitment to building out its own small drone production capability. The Minister signed a "defence UAV pact" at Eurosatory that establishes a new framework and vision for working with French industry to develop drones below 150 kg. Lecomu acknowledged that France had fallen behind in the design and production of small drones for the military. The new pact is designed to speed up the procurement of small drones, ensure the capacity to integrate new technologies, and to build a small drone industry by the end of the decade that includes both traditional military suppliers and makers of small commercial and hobbyist drones. This list of providers includes companies such as French company Parrot, which is one of a handful of French drone companies that have delivered systems to Ukraine.

2.2	**Doctrine upgrades required for uncrewed systems in anti-submarine warfare** An *Armada International* article argues that doctrine challenges, as much as technological ones, are slowing the adoption and operational use of uncrewed maritime systems in support of anti-submarine warfare (source). *Assessment:* An article in the June-July volume of *Armada International* explored the potential for uncrewed surface vehicles (USVs) and uncrewed underwater vehicles (UUVs) to play a more prominent role in the frequently arduous and time-consuming task of anti-submarine warfare (ASW). The article makes the case that these uncrewed assets are a more cost-effective means of adding mass to a fleet and completing dull, dear, dirty, dangerous, deep and long duration missions, including ASW. It also highlights case studies such as the Saildrone USV and BlueWhale UUV that demonstrate how USVs and UUVs are being introduced to support ASW missions, especially in roles such as long-range, extended surveillance and detection of other submarines or mines. However, the article also argues that adoption of these new capabilities is slowed by a range of challenges and gap in technology development and requirements development processes. Most notably, the piece points to a gap between the development of new enabling technologies such as open architectures, artificial intelligence, and extended range systems and doctrine issues such as: • Managing the need for human intervention in autonomous systems • Determining which uncrewed systems are attritable (and recoverable) and which are not and how to best deploy these different systems in different roles and missions • How best to secure and transmit the data collected by these systems Ultimately, the article reveals the critical adoption tension between technological advancement and actual use of novel technologies to achieve a specific objective such as detection of enemy submarines or ASW capabilities. It concludes that “a sound doctrine will help naval forces overcome technological limitations and, when the time is right, integrating UUVs and USVs into ASW to their full potential.”

2.3	**Uncrewed ground vehicles making their move** Industry and militaries are focusing more on the utility of uncrewed ground vehicles to support human operators in combat operators according to both sources in Ukraine and reporting on the Eurosatory Exhibition in Paris in June. (source and source) *Assessment*: Reporting from multiple sources during the reporting period pointed to the increased utility of uncrewed ground vehicles in a range of roles supporting human operators on the modern battlefield. A June profile of Ukrainian efforts to develop UGVs includes comments from Mykhailo Federov, Ukraine's minister of digital transformation that suggest a new focus as one of the combat solutions to "fight instead of people." Specifically, Ukraine reportedly hopes to use new ground robots in support of direct combat (e.g., launching fires against adversary forces), minelaying, intelligence, surveillance, and reconnaissance, and logistical operations. These systems can be operated remotely from up to two-and-a-half miles away. A Ukrainian government fact sheet about evolving UGV capability states that "squads of robots will save the lives of our military and civilians. They will fight alongside people and for people. The first robots are already proving their effectiveness on the battlefields, but there are many more required." The country's UNITED24 initiative has recently announced a fundraising campaign to acquire three types of ground robots for the military: combat robots, self-destructive robots and minelayers, and logistical / medical evacuation systems. In addition, reporting on the Eurosatory defence exhibition in Paris in June stressed the prominence of UGVs at the show and of teaming between human operators and ground robots that are also equipped to release UAS. For example, Teledyne Flir demonstrated the SUGV 325 system that is light enough to be carried by a single person and is fitted with an arm-like structure for grabbing robots. It also carries a nano aerial drone –the Black Hornet 4, that can be released to provide additional forward intelligence to human operators. Nate Winn, the director of product management for unmanned systems at Teledyne told *Defense News* that robots are envisioned as being "good unmanned aerial partners for unmanned aerial systems, you can lean into the good of the robot—eight hours of runtime, capability to carry heavier payloads, and persistence—and pair it with the drone's agility and speed." Specifically, the combination of ground and aerial vehicles offers increased opportunity for a robot, rather than a human, to be the first contact with adversary forces, allowing for increased collection of intelligence and reduced risk to human operators.

Figure 1: An image on UNITED24's website shows the both the scale of the requirement for UGVs in Ukraine as well as prototypes for three different types of UGV systems: 1) combat UGVs; 2) minelayer UGVs; and 3) Logistics UGVs. Source: UNITED24 website

3. Digital Communications and Cyber

3.1	**NATO launches new cyber unit** To combat growing cyber threats from state-backed groups, NATO established the Integrated Cyber Defence Center (NICC) during the 75th Anniversary NATO Summit in July in Washington D.C. (source and source) *Assessment:* The new centre will be based at NATO Supreme Headquarters Allied Powers Europe (SHAPE) in Mons, Belgium. The NICC will focus on threat identification and information sharing. As one NATO representative explained to *Defense Scoop* ahead of the summit: "The idea is that there are multiple aspects to it. One is information-sharing — just ensuring that all allies know what the others are doing, making sure that they are on the same level and that they exchange knowledge. Another part of it will be developing [capabilities] together. And the third one is kind of focused on defence of cyber-attacks and so on." NATO has increased its emphasis on the cyber domain over the past several years in light of the growing prominence of the threat against NATO states. According to the NATO website, "Cyberspace is contested at all times and malicious cyber events occur every day, from low-level to technologically sophisticated attacks. NATO and Allies are responding by strengthening the Alliance's ability to detect, prevent and respond to malicious cyber activities". NATO leadership seeks to have the new command up and running by 2028.

3.2	**Accelerating response to novel threats in the EM spectrum** The United States Air Force's Exercise Rapid Raven underscored the importance of both technological and process innovation to ensure electronic warfare threat detection algorithms are updated at the speed of relevance (source) *Assessment:* The competition in the electromagnetic (EM) spectrum is a crucial component of emerging conflict. Ensuring the capacity to detect is a preoccupation of military planners and operators in order to maintain the capacity to communicate, navigate, and survey enemy positions. In late 2023, the head of the U.S. Air Force's 350th Spectrum Warfare Wing, Colonel Josh Koslov, announced that his organization sought to move from a schedule of updating EW threat recognition software quarterly to completing this task in three hours or less from novel threat detection.. In early June, Koslov revealed that the unit's Exercise Rapid Raven had proven more than half of the electronic warfare and radar systems the unit supports are exceeding that deadline. The longer-term vision for defensive EW (cognitive warfare) involves a system diagnosing a novel threat and fashioning a response on board the aircraft on which it is flying. However, the amount of computing power and bandwidth required to do this currently forces new threat intelligence to be sent to central data centres to be interpreted and processed and then sent back to the tactical edge. Speeding up this process—and eventually pushing more data processing to the edge—requires both technical improvements, especially in computing power and bandwidth as well as the use of open architectures that can easily adapt new processes. However, the experience of the 350th also reveals the importance of organizational and process innovations that enables a freer flow of information and ensure more frequent updates of software.

3.3	**Incoming call . . . and ordnance? Russians using personal cell phones for communication** The practice brings risk but also may be difficult to stop and is likely to be a factor in other future conflicts (source)
	Assessment: Russian soldiers are relying on their personal cell phones to communicate on the battlefield in Ukraine due, in part, to what observers refer to as a lack of more expensive secure communications options. The practice of using personal and unsecured cell phones heightens the risks of detection a risk Ukrainian armed forces have previously exploited to launch strikes on Russian forces whose positions were revealed through the use of personal cell phones. To dissuade the use of personal devices, the Russian State Duma has proposed a measure that permits soldiers to be punished for using personal phones while fighting in Ukraine. This amendment has been criticized by Russian observers who note that use of personal devices is first and foremost a necessary adaptation to the lack of secure communications in theatre. Personal cell phone usage has become critical to battlefield operations, logistics, and command and control. According to the Institute of the Study of War, "Russian milbloggers claimed that Russian service members significantly rely on the personal devices to transmit target coordinates to call for fire from Russian artillerymen and drone operators to navigate frontline areas, and to coordinate between units." The tensions and challenges associated with the use of personal phones in combat zones is unlikely to be limited to Ukraine. Mark Cancian, an advisor with the Center for Strategic and International Studies noted that "it is extremely difficult to get the troops to give up their phones and internet devices because this generation of young people has organized their lives around their phones and the connections that phones can bring."

3.4	**Life imitates (operational) art: NATO counter-drone exercise impacted by real-life jamming** NATO's Ramstein Legacy air and missile defence / counter-small drone exercise was affected by real-world efforts to spoof and jam navigation and communications from platforms and systems participating in the exercise (source) *Assessment:* The 3 – 14 June drill, was designed to support development of integrated air and missile defence with a specific emphasis on coping with the threat from Class 1 small drones. As a representative of NATO's Communications and Information Agency (NCIA) assessed, "Class 1 UAS have become one of the most important threats we observe at the moment in military conflicts. Where for many years having air superiority was one of the pillars of the NATO doctrine, we have seen recently that's no longer the case." In addition to simulating the small drone threat, the exercise also included an unexpected real-world demonstration of the challenges associated with a contested electromagnetic spectrum. While NATO did not name the actor thought to be responsible for the interference, both drone operators and fighter pilots supporting the exercise reported high degrees of spoofing and jamming of systems. One drone operator reported that his drone controller showed the drone was in Crimea when it was actually in Romania participating in the exercise. In addition, one Finnish fighter pilot reported high degrees of jamming and gave an indication that the threat was not necessarily new, nor the likely origin of it unknown, telling *Defense News* that "we have a lot of reports in Finland about the same kind of jamming so we are used to that . . . you can say we know our neighbour."

4. Sensors

4.1	**Impossible: Chinese scientists claim to have developed new hypersonic radar** Chinese scientists claim to have developed a microwave photonic radar that can detect and track multiple hypersonic systems traveling at up to Mach 20 with exceptional accuracy (source –firewalled—and source) *Assessment:* In ground-based testing, the team from Tsinghua University and Guangxi University reported that the new radar was able to track 10 hypersonic vehicles traveling up to 20 times the speed of sound. The team reported the radar had a 99.7% accuracy in estimating missile speed and could also detect false targets, which can be a challenge when attempting to track such fast moving objects, adding a level of precision vital to targeting high-speed and manoeuvrable hypersonic weapons. The research findings were published in Chinese-language journal, Optical Communication Technology according to the *South China Morning Post.* The researchers successfully addressed the challenge of creating and analysing high-precision radar signals by integrating lasers into the radar design, allowing information to be transmitted between points at the speed of light. The microwave photonic radar reportedly has a detection range of 600km and is small and light enough to be mounted on an air defence interceptor or aircraft. Developing a fire-control radar for detecting, tracking, and accurately targeting hypersonic weapons has been a challenge for hypersonic defence. Indeed, a 2023 U.S. think tank report highlighted this issue as a critical and persistent technical challenge for U.S. air and missile defence efforts to meet the emerging threat from hypersonic weapons.

5. Platforms and Weapons Systems

5.1	**Resource strain and intelligence gathering are allowing Russian drones to exploit gaps in Ukraine's air and missile defence** A 16 July interview in the *New Voice of Ukraine* with a military expert outlined the scope of the challenge related to Russia's effective use of reconnaissance drones to target missile attacks against targets in Ukraine (source) *Assessment:* The interview with Oleksandr Kovalenko of the Information Resistance project, a military expert and contributor to *New Voice of Ukraine* and other media outlets on the Ukraine war, offers useful insight into how Ukrainian resource constraints are creating operational opportunities for Russian forces. Specifically, Kovalenko lists three main challenges and vulnerabilities that are allowing increased penetration of Russian small reconnaissance and targeting drones deep into Ukrainian territory: 1) A shortage of short and medium range air defence assets; 2) Russian adaptations that include flying drones at higher altitudes and out of range of some of the already strained Ukrainian air defence assets; 3) Improved Russian intelligence and understanding of where Ukrainian air defence assets are placed, allowing Russian drones to follow routes into and across that are less dangerous The interview also identifies additional ways of increasing engagement of Russian reconnaissance drones beyond the acquisition of more relevant air defence systems. For example, it cites the use of Yak-52 light aircraft in Odesa Oblast to effectively attack enemy drones, though the expert also laments that this approach has not been scaled in other parts of the country, despite the availability of pilots and planes to do so. A third approach is through the use of EW systems to jam incoming drones, but here again, there is a perceived shortage of these types of systems as well.

5.2	**From beneath the sea to Low-Earth Orbit (LEO): People's Liberation Army (PLA) scientists exploring targeting Starlink satellites with lasers from submarines** PLA scientists developed a study that claims submarine-based lasers could provide an efficient means of disabling large commercial satellite constellations such as Starlink during times of conflict (source) *Assessment:* The study details the value of mass-producing submarines carrying a megawatt-class solid state laser weapon installed in its midsection. The subs would be capable of remaining submerged while raising a retractable "optoelectronic mast" to fire at satellites before diving back down. The use of submarine-based lasers addresses several challenges associated with disabling communication and sensing satellites in LEO. First, the use of ground-based kinetic weapons to strike satellites is more expensive but also reveals the position of the system being fired. Once exposed, these systems become vulnerable to counterattack. This risk is reduced by using submarines, which can quickly fire multiple shots at LEO satellites and then submerge. Second, the use of large constellations of small satellites operating in LEO has increased the resilience of space-based operations. The use of lasers fired from several submarines could provide an affordable means of engaging a larger number of satellites in a given constellation, disabling it or reducing its efficiency and utility.

5.3	**A new design and review for GCAP at Farnborough** BAE Systems and its industry partners Leonardo and Mitsubishi Heavy Industries (MHI) revealed a new design for the 6th Generation Global Combat Aircraft Program only days after the new UK Government called for a Strategic Defence Review to evaluate key programs and priorities (source and source) *Assessment:* Industry partners from the United Kingdom, Japan, and Italy revealed a new design model for the GCAP 6th Generation fighter concept during the Farnborough Air Show outside of London in late July. The new "more evolved" design is notable for its delta design and considerably larger wingspan, which offers it increased range. One estimate of the new design's size places it close to that of the F-15 The reveal of the new design comes only days after the new British government ordered a comprehensive Strategic Defence Review to reevaluate whether the country is properly aligned and resourced to meet the threats it faces. While the newly announced review introduces some uncertainty for the GCAP program, newly elected Prime Minister Kier Starmer did attend the Farnborough Air Show and commented that the GCAP program is "very important" for the country. GCAP aircraft are set to come online in 2035 and replace Eurofighter Typhoons and Japan's F-2s. As a 6th Generation fighter, the aircraft are designed to be stealthy and to operate with loyal wingman-type UAS and to carry advanced offensive and defensive EW capabilities. Currently, the program boasts three partner nations in the UK, Italy, and Japan, though there are some indications Saudi Arabia may join the program, and industry partners have emphasized that they "are developing a construct that is able and open for other partners."

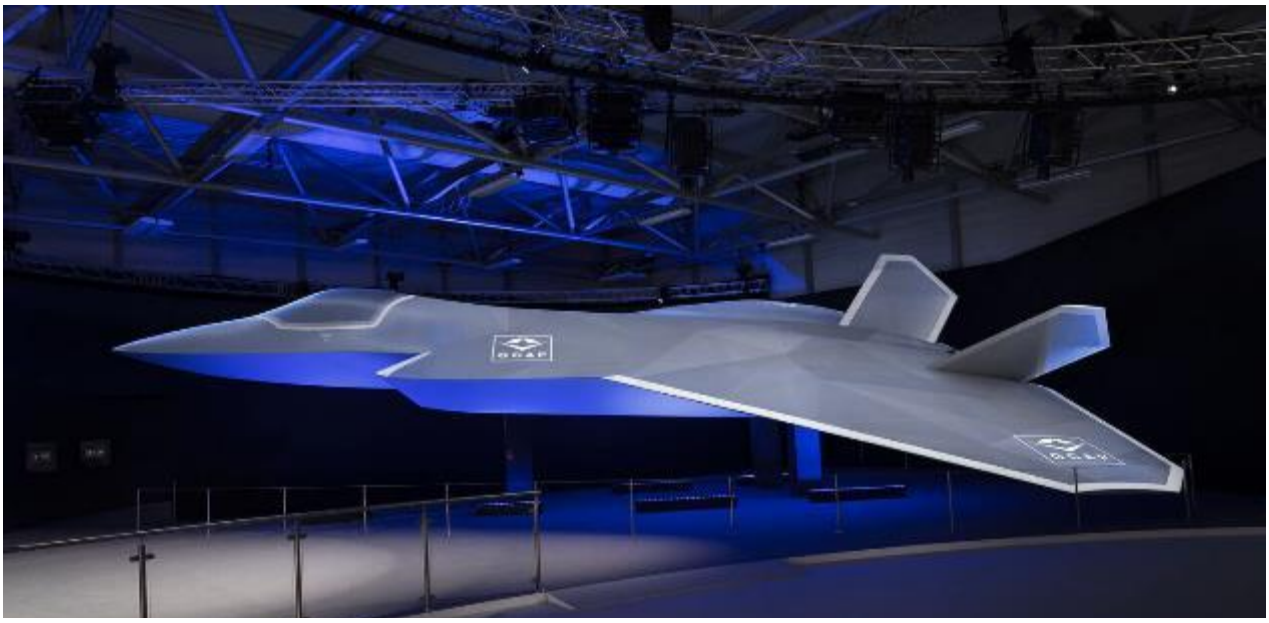

Figure 2: The new GCAP design displayed at the Farnborough Air Show in July 2024. The new design features a delta wing design and much larger wingspan than previous versions. Source: BAE Systems

5.2	**In other news: U.S. Next Generation Air Dominance (NGAD) program to take a pause as Collaborative Combat Aircraft (CCA) program speeds ahead** The U.S. Air Force announced a pause in its 6th Generation fighter program—one of the highest profile modernization programs the Service is pursuing—while its loyal wingman program appears to be making considerable progress (source) *Assessment:* On 30 July, the secretary of the U.S. Air Force announced that the NGAD program would be paused for "a few months" for a re-evaluation of the program's concept, progress, and industrial strategy. While there had been hints of challenges with the NGAD program during the reporting period, the confirmation that one of the Air Force's highest profile modernization programs would be paused was a significant and, for some, surprising decision. During a keynote speech at the Life Cycle Industry Days in Dayton, Ohio, Kendall committed to moving forward with a crewed next generation fighter but said that the Service would need to halt current development plans to ensure that it had "the right process? … The right operational concept? Before [the U.S. Air Force] commits to moving forward on a single design [and a] single supplier, we're going to take a hard look at that." Among the challenges that needed to be reconsidered and incorporated into an updated design concept was China's growing capacity to target U.S. and allied runways in the Indo-Pacific, creating a need for the ability to use makeshift runways or to carry out vertical / short-take off and landing operations. Challenges with the NGAD program were initially hinted at in June when Air Force chief of staff Gen. David W. Allvin said that NGAD was one of many choices available to the Air Force to meet the demands of next generation air combat within the constraints of the Air Force's budget. One potentially positive development related to U.S. efforts to modernize its Air Force and produce affordable scale has been the advancement of the Collaborative Combat Aircraft (CCA) program. CCA is charged with developing options for loyal wingman UAS that will support both 5th and 6th Generation aircraft in combat. On 29 July, the Air Force announced it had made contract award to five companies to develop versions of the autonomy software for the CCA program. The names of the companies were not specified. Previously, the Air Force had awarded contracts to General Atomics and Anduril to develop initial alternatives for the CCA aircraft.

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